TIMING MEETING #4 – Minutes

Presents:

Anton Jusko (ALICE), Antonello Di Mauro (ALICE), Thilo Pauly (ATLAS), Till Eifert (ATLAS), Jan Troska (CMS), Jeroen Hegemann (CMS), Federico Alessio (LHCb), Philippe Baudreghien (RF), Sophie Baron (TTC).

Absent: Marian Krivda (ALICE)

Excused: Jose Noirjean (RF)

Meeting Aims:

Prepare for the restart, reviewing:

- the equipment
- the cogging procedure
- our tools (BPTx systems, resolution, precision, refresh rates)
- the new Vistar

Prepare the list of DIP publications for the Vistar.

Slides and Material

- Indico page of this meeting: https://indico.cern.ch/event/367052/

Teams for 2015

- ALICE: Anton, Antonello, Marian
- ATLAS: Thilo, Till
- CMS: Jeroen, Jan
- LHCb: Federico. (Richard will gradually not be involved anymore in timing questions)
- RF: Philippe, José
- TTC: Sophie

RF2TTC & RFRx modules

- Each experiment has 2 RF2TTC modules. One in the TTC crate, one as a spare. All experiments would appreciate having a third one for lab test (to be sure having one RF2TTC as a hot spare downstairs).
- The RFRx maintenance and support is ensured by the RF Piquet. A few new members of the RF Piquet would need a visit in the experiments to see where the RFRx modules are hosted.
- Philippe insisted on the fact that in case of problem the experiments should always check the RF/TTC signals status board first (on the vistar) before doing anything else. Moreover,

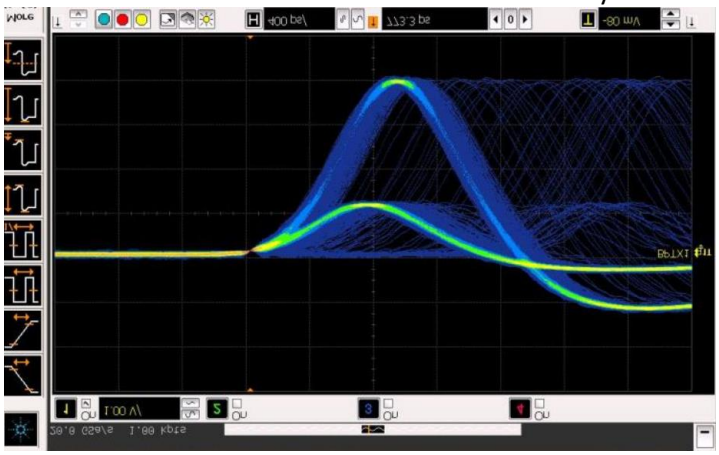
Philippe insisted on the fact that there must be spare fibers in case one of the signals would not arrive to the experiments. The answer is that the experiments are all using only the pair BC1/Orb1, but always have the second beam connected to their RFRx. It is thus easy to switch from beam1 to beam2 timing signals in case of need (they are identical most of the time, except during ramps for ions-protons runs). On top of this, there are still 2 spare fibers for ATLAS and CMS (called BCref and FrevRef). For ALICE and LHCb, only the FrevRef is available as a spare, as the other one is used for the sunglasses project.

BPTx

- in Run1 LHCb and ALICE (as well as ATLAS and CMS) saw that for some fills the deltaT would slowly drift during a fill, sometimes even to 200ps, seen as a drift in the phase of beam1 or phase of beam2. This drift can be positive or negative, without evident correlation with intensity (sometimes beam2 was shifting while beam1 was the one loosing intensity).

- LHCb investigated on the BPTx signal:
    - The BPTX bipolar pulse has a zero-crossing which is not exactly at the zero-level voltage, as expected by simulations, but it is slightly shifted to the negative side of the pulse (-100mV).

  We will discuss this with the BE/BI team in charge of the BPMs and see with them if they have more information on the behavior of these systems.



- Accuracy, Precision & refresh rate:
    - ATLAS and CMS: Precision O(10ps), refresh rate 0.5 Hz
    - LHCb and ALICE: Precision O(30ps), refresh 0.01 Hz

  The accuracy is not as easy to evaluate. It is decided that after restart, one stable beam period will have to be arbitrarily declared as the reference for all experiments, to which all of them will zero their BPTx phase measurements. This will ease further fine alignments and cross check between experiments.

- Seasonal and daily drift of the timing signals vs temperature: All the experiments except CMS are suffering from these drifts. They are monitored by the BPTx and are precisely compensated using CORDE modules (ATLAS and ALICE) every hour or so (even during a single fill). LHCb is less demanding in term of window and can easily sustain daily drifts, so

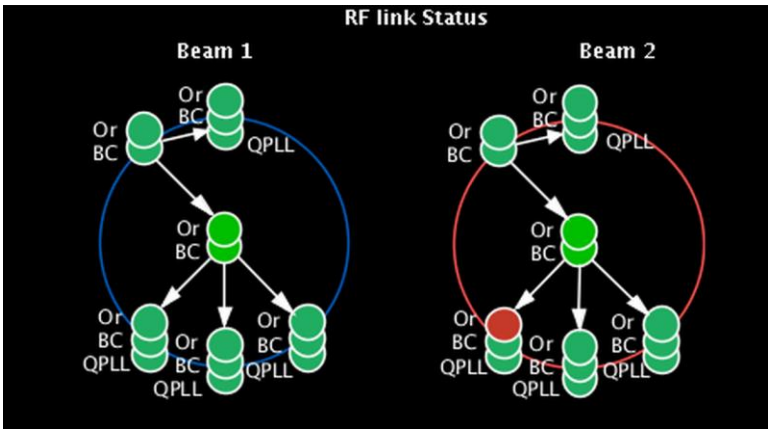
the compensation is not systematically done before each fill. The CORDE is not used by LHCb for the moment. Typical seasonal drifts observed by ALICE, ATLAS and LHCb are of the order of 8ns for 14km of fibers.

Cogging Procedure

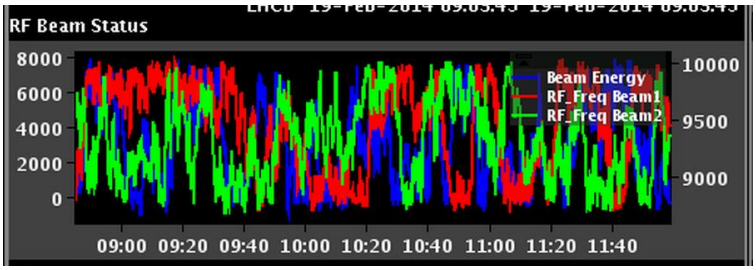
- Philippe explained that the procedure will be done the same way than in 2009.
- Aim of operation this time: after first beam in the machine, the aim will be to go as fast as possible to 6.5TeV, but at low intensity
- The slot for the cogging will be requested by the RF when the 2 beams during the first week of commissioning with 2 beams. However, it will be useful that the experiments do estimate in advance an order of magnitude of the deltaT (which will very likely be of the order of us) by measuring independently each BPTx signal position wrt to their reference during commissioning of each beam.
- The Cogging Blog will be used to post and exchange measurements.
- Moreover, Sophie will set-up a virtual meeting to have a continuous open line (via Vidyo) during the cogging. She will also open a 'chat room' to write down short measurement values (the log of the chat room can be saved at the end of the session, allowing to keep track of the cogging procedure). This will be tested during the RF ramp tests on 06/02/2015.

RF Timing Vistar

- Comments on the new vistars:
  - Global comments: this tool will be useful for the signals status, for the Operation to check the RF frequency, and for the RF and the experiments for the fine alignments and the drift follow up. As expected, it will however not be suitable for the cogging procedure which is too specific.
  - As defined in the specification document, all the publications (including the RFRx status) will be under the path: dip/*exp*/LHC/Timing/. We will update the LHC-OP-ES-0024 rev 1.2 (LHC expt data exchange document) with Reyes asap to include this information. (the chapter was already there in the document, but was never completed).
  - TTC/RF signals status board:
    - Jan said that we should differentiate the status of the RF**T**x from the status of the RF**R**x modules: the 2 circles at SR4 should display a different name (for example P_Or and P_BC).



- Philippe said that it would be much more useful to display the BC1 and BC2 frequencies as measured from one of the experiments instead of using the FGC freq value or any of the RF-generated value. It will be a real monitoring of what the RF is distributing and will be very useful for the Operation Team that is asking for such a monitoring. Thilo and Till are already measuring and logging this information in ATLAS, and kindly offered to publish the 2 frequencies (with sub Hz resolution and the GMT GPS 10kHz signal as a reference). We will thus change the following plot and use these data instead of the FGC freq. The DIP path will be: dip/ATLAS/LHC/Timing/Freq_B1 and Freq_B



- Jan suggested that we find a way to identify the deltaT and phase values when they are out-of-range from when they are badly published (DIP status not GOOD) or unreachable. A proposal will be made in that sense.

Next steps

- Next meeting: first half of March, before start of commissioning with beam.
- By then, the experiments should try to publish at least the RFRx status (and the BC frequency for ATLAS if possible)